

Claims

1. Method for cutting a workpiece by using a laser beam and an assist gas, in which at least one optical means is used to focus the laser beam at several focal points, separate from one another, and in which, as assist gas for the said laser beam, a gas mixture containing hydrogen and at least one inert gas is used.

5. Method according to Claim 1, characterized in that the optical means is transparent or reflecting and is chosen from lenses, mirrors and combinations thereof, preferably a bifocal lens.

10. Method according to either of Claims 1 and 2, characterized in that the workpiece to be cut is made of stainless steel, coated steel, aluminium or aluminium alloy, non-alloy steel or alloy steel.

15. Method according to one of Claims 1 to 3, characterized in that the inert gas is chosen from nitrogen, argon, helium and mixtures thereof, preferably the inert gas being chosen from nitrogen, argon and mixtures thereof.

20. Method according to one of Claims 1 to 4, characterized in that the assist gas contains from 150 ppm by volume to 40% by volume of hydrogen, preferably from 0.5% by volume to 30% by volume of hydrogen, the balance being the inert gas.

25. Method according to one of Claims 1 to 5, characterized in that the assist gas consists of 5% by volume to 30% by volume of hydrogen, the balance being nitrogen.

30. Method according to one of Claims 1 to 6,

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characterized in that the thickness of the workpiece to be cut is between 0.2 mm and 20 mm, typically between 0.3 mm and 16 mm.

5 8. Method according to one of Claims 1 to 7, characterized in that the cutting speed is between 0.5 m/min and 20 m/min.

9. Method according to one of Claims 1 to 8, 10 characterized in that the optical means is arranged so as to obtain at least one first focal point positioned near the upper surface of the workpiece to be cut, preferably so as to coincide with the said upper surface, or in the thickness 15 of the workpiece to be cut in a region close to the said upper surface, and at least one second focal point positioned near the lower surface of the workpiece to be cut and in the thickness of the latter, or outside the latter.

20 10. Method according to one of Claims 1 to 9, characterized in that the assist gas contains hydrogen in an amount adjusted according to the thickness and/or the constituent material of the 25 workpiece to be cut.

11. Laser beam cutting apparatus for implementing a method according to one of Claims 1 to 10, comprising:

- 30 at least one laser generator for generating at least one laser beam;
- at least one cutting nozzle with at least one laser beam inlet and at least one laser beam outlet;
- at least one transparent or reflecting optical 35 means of the multifocus type for focusing the said laser beam at several focal points; and
- at least one source of assist gas containing hydrogen and at least one inert gas for the said laser beam and for feeding the said nozzle

with the said assist gas.

12. Laser beam cutting apparatus for implementing a method according to one of Claims 1 to 10, comprising :

- 5 - at least one laser generator for generating at least one laser beam;
- at least one cutting nozzle with at least one laser beam inlet and at least one laser beam outlet;
- 10 - at least one transparent or reflecting optical means of the multifocus type for focusing the said laser beam at several focal points;
- at least a first source of gas containing at least hydrogen;
- 15 - at least a second source of gas containing at least one inert gas; and
- gas mixing means for mixing the gas coming from the first gas source with gas coming from the second gas source so as to obtain an assist gas for the said laser beam containing hydrogen and at least one inert gas, the said assist gas feeding the said nozzle.

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